



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

ectosarc of the parent, but remain for some time just outside of the latter, and apparently attached to it either by a sort of plasma or by short stalks. Fig. 4.

4th. The embryos develop cilia and swim away as free, ciliated embryos. Fig. 5.

5th. The ciliated embryos become fixed to some object and acquire a triangular shape and a few (three or four) suckorial tentacles at each antero-lateral angle. At about this time the single anterior contractile vacuole appears. Fig. 6.

6th. The animal now grows longer, and gradually acquires more suckorial tentacles until the adult form is reached. The development is illustrated in figs. 7, 8, 9, 10, 11, none of which are hypothetical, each having been observed by the writer.

Fig. 2. represents an individual of nearly twice the ordinary length, showing two transverse constrictions or markings of the ectosarc. In this, as in most other specimens examined, the animal is largely obscured by various objects, which seem to adhere to its surface as if it were covered by a viscid substance.

AN INQUIRY INTO THE STATE OF EARTH'S INTERIOR.

BY IRA SAYLES.¹

THERE seems to be a strangely broad difference between the conclusions of the geologists and the physicists on the condition of Earth's interior. This broad difference, therefore, invites every thinker to think for himself, and to conclude as best he may be able. As a thinker I enter the lists.

It is manifest, from a bare inspection of the question at issue, that it demands both the inductive and deductive processes of ratiocination. Inductively, the fact of heat must be established, its extent established, and its persistence established: deductively must its maximum be reached, its effects be reached, and the main results of these effects be reached.

¹ U. S. Geological Survey.

The geologist observes the lines of volcanoes girdling the earth as it is, and concludes that *there must be a very extensive ocean of molten matter beneath Earth's crust*, to say the least.

He turns his attention to the great continents with their mountain ranges, high plateaus and low broad valleys, and finds a somewhat astonishing degree of instability everywhere. Upheavals and submergences are everywhere in progress. From these signs he argues, and that rightly, that *there must be a translation of matter from point to point beneath the surface*.

This, he further argues, is consistent with fluidity only. A very legitimate conclusion surely.

He takes another line of observations. He descends into the crust of the earth, and everywhere finds *the temperature augmenting as he descends*. Though this augmentation is constant, the rate of increment is not in all places the same. Still, however, this universal fact of increase of heat points straight to one conclusion, and corroborates the conclusion drawn from volcanoes, elevations or upheavals and submergences, viz., *the temperature of liquefaction must be reached*. All known rocks must become fluid.

He turns to the record Earth has kept of her past history. There he finds that, in all geologic history, upheavals and submergences have been common everywhere. He finds volcanoes have always existed. Moreover, he finds that great gaping rents have lacerated Earth's adamant bosom, and that through these huge rents vast streams of molten matter from the interior have gushed out over land and into ocean, spreading devastation wherever it flowed.

He now discovers that this molten condition of the interior has remained a persistent fact from the very earliest geological eras—undetermined millions of Earth's years—*millions*, not thousands. Millenniums are but days in this great record. *Interior heat has, therefore, been a persistent fact, and a persistent factor in geologic dynamics*.

Moreover, these facts of upheaval and submergence, being universal, declare the universal fluidity of the great Earth-heart within. It is no circumscribed lake, as suggested by some. *It is one universal mass of excessively high temperature*.

When, however, the geologist concludes that fluidity will be reached at about the point indicated by his observed rate of augmentation of temperature, along a descending line, his con-

clusion is a *nonsequitur*, because he fails to recognize the changed conditions. As the line descends, *pressure increases directly as the line lengthens*. Now, one class of physicists claim that the increment of pressure is persistently superior to the increment of heat but these physicists fail to notice that, when high temperature and high pressure are simultaneously exerted on the same rock, the character of the rock is changed, so that *it becomes a far higher conductor of heat*; and that, therefore, *the incremental ratio for the heat very far exceeds the increment of pressure*. Hence fluidity is assured; but, this point once reached, another law comes in, viz.: *The conduction and interstitial radiation become extremely rapid through the fluid mass, so that the temperature of the fluid is uniform with the temperature of the entire nucleus*, and therefore *no further augmentation can take place*; but the ratio of pressure augmentation does not change. So that the increasing pressure soon overtakes the expanding power of the maximum heat, passes its limits, and solidifies all the nucleus within this limit.

An ideal section through the Earth's centre will, therefore, show the following:

First, an outer solid envelope.

Second, a semifluid envelope.

Third, a fluid envelope.

Fourth, a semifluid envelope.

Fifth, a solid nucleus.

No. 1 results from reduced temperature alone.

No. 2 results from pressure and a temperature not quite sufficient for liquefaction.

No. 3 results from a temperature sufficiently high to liquefy it under high pressure, and *is the maximum temperature*.

No. 4 results from the increase of pressure so as to be just overtaking the expansive power of the maximum temperature.

No. 5 results from a pressure so high as to overcome, completely, the expansive power of Earth's *maximum heat*.

At the centre of Earth the pressure, taking her general average, $5\frac{1}{2}$, water being unity, is 7,180,593,750 lbs. to the square foot—a pressure so enormous that no known substance could fuse beneath it at Earth's maximum temperature. Even hydrogen would be as hard as diamond at this maximum temperature of the internal nucleus.

In the foregoing I decline to fix the limits to any one of the five regions of the section, and content myself with showing that they must all find a place, and in precisely the order named, and for the reasons named.

All the above is strictly in accordance with observed facts, and as strictly in accordance with the laws of heat under pressure, both acting on the same matter at the same time.

I have strictly refrained from special theories, and thereby have avoided personalities.

SOURCES OF EARTH'S INTERNAL HEAT.

First. The source of the primary heat of this internal mass was the arrestment of the cosmic motion of the atoms, by centralization under the laws of gravity and rotary motion of the mass about Earth's axis. The free descent along the line of the axis must have resulted in an exceedingly high motion, and this motion was arrested at the centre, and in the growing nucleus, forming by their union.

Second. The heat, thus evolved, initiated chemical action among these atoms thus rushing in. These were the sources of the original nuclear heat.

When the mass was solidified, the heat was so high that very many of the superficial elements existed in their gaseous state only, forming an envelope around the central heated mass.

Finally, when this central mass had so far lost its fiery energy as to permit their descent in a liquid state, they descended in the order of their respective heat-endurance. Now, in their turn, they began to solidify, and form the outer crust.

Last of all, when the outer coating of this outer crust had reached the proper temperature, the water began to condense on the tops of all jutting peaks. Chemical action again set in as this water reached the alkine minerals. Here was another accession of heat.

In due time Earth became productive of living organisms. Water began to tear down the incipient mountain ridges, carry the debris down into the young ocean, and there form the sedimentary rocks. The thin crust frequently bent beneath their accumulating weight, and brought these half-formed rocks within the influence of this internal heat. Chemical action again, to a greater or less degree, modified them, and they were hardened into rocks.

Finally, the sun burst through the primeval shroud, or swaddlings of the new-born Earth, and began to lend its heat, to warm up the tender young bosom of Earth, and to fecundate her developing powers. Ever since that beginning, the sun has not failed for an instant, to pour in his genial warmth over some portion of Earth's surface. This warmth, in the form of organic bodies, has constantly been sinking into the same surface; and, though we take little note of it, this amounts to a vast quantity, in geologic ages.

I believe the foregoing is a fair summary of the case. I undertook to investigate. It is only a summary.

ON SOME INTERESTING DERIVATIONS OF MINERAL NAMES.¹

BY F. M. ENDLICH.

IN bestowing a name upon any hitherto unknown substance, two factors mainly contribute to determine its character: The circumstances attending the discovery, and the facts which have become known in relation to such substance. The basis upon which the new name has been formed may, in a general way, afford an indication of the scientific standard of its sponsor or of the period during which it became known.

Probably the first thought which the sight of a new mineral, for instance, may occasion, will refer to its geographical origin or physical appearance. The second question might, appropriately, refer to its composition; the third, to special characteristics and to its uses. We find, in point of fact, that a number of minerals were named by

¹ As any dissertation upon a subject like the derivation of mineral names must, of necessity, largely be a compilation, I have refrained from making citations which would uselessly cumber the article. I have principally utilized the publications of Theophrastus, Dioscorides, Pliny, Agricola, Beudant, Cæsius, J. D. Dana, Domeyko, Estner, Gessner, v. Kobell, Linnæus, Matthesius, Naumann, Pape, Quenstedt, Wallerius, Weigand, and Werner, besides various lexicographic and poetical works. The manner in which I have presented the subject is essentially original, and a number of suggestions have been introduced which may throw light upon some doubtful points or furnish hints for further elaboration.—E.